the countryside. In the case of the Cornish tin mines, much of the skill, experience and capital released from local mines was transferred abroad—many Malayan companies are offshoots of Cornish parents and are often staffed by Cornish miners. Camborne and Redruth came to depend on foreign investments—one solution, perhaps a rare one, of this difficult problem.

(b) Lead was won by the Romans and at this moment is being worked again in Cumbria and elsewhere. The position is much as with tin, except that there is here an additional complication: that of noxious effluents and poisonous fumes from smelting. The first promise often to destroy freshwater life, including valuable fisheries; the second may ruin agriculture as well as natural vegetation for miles round. The aftermath is terrible. The same is true of the extraction of salt, gypsum, and the associated heavy chemical industries.

(c) Iron ore. The once flourishing iron industry of the Weald has gone, leaving little or no trace; the iron industry of the South Wales coalfield is more recent and has left behind a solid core, in peace-time conditions at least, of unemployment. In the Black Country, the evils have been mitigated by the switch over to other industries. The latest phase of maladjustment in the iron industry is seen in Northamptonshire, where thousands of acres of good agricultural land are being left, after removal of the ore, a stony desert of steep ridges and valleys useless to man and beast and affording little hope even for useful vegetation or afforestation. Yet a limited expenditure, with the aid of modern levelling machinery of the type now being used on aerodromes, could restore this land to usefulness.

(d) Slate quarries, chalk quarries, and other scattered surface workings, including those for gravel and sand, raise especially questions of amenity and the need for regulation, including definite directions towards the location of industry, in national planning.

(e) Coalfields afford examples of the problems raised by mineral working at their most difficult. A coalfield develops slowly, and its development gives rise to such permanent towns and villages that the subsequent problems of readjustment are extremely difficult. So rooted are the human beings that the solution of the problem has tended to be, not the 'scrapping' of the settlements—which is the logical course—and the removal of the people, but the deliberate effort to bring industry of new types to the pool of labour thus available.

These examples, drawn from Britain, are sufficient to illustrate the far-reaching character of the human and economic problems raised by the apparently simple proposition of sharing the world's mineral resources. It would seem that three principles emerge:

(1) Mineral exploitation inevitably results in a need for restoration, whether it be of land or of the social structure of the community.

(2) This restoration should be obligatory on those, whether nations or individuals, who derive benefit from the working of the minerals.

(3) In the latter stages of mineral exploitation there is never a surplus of money, and therefore there should be some provision, comparable to an amortization insurance, made when the industry is flourishing, for use in the later stages for the work of restoration and rehabilitation.

A STUDY OF ACCIDENTS

EMERGENCY REPORT No. 3 of the Industrial Health Research Board* is concerned with the problem of accidents, always important but still more so in war-time, when many circumstances combine to increase the risk of accidents. There is a tendency on the part of many people to accept accidents as inevitable happenings; one has only to recall the indifference to road accidents before the War to realize this. For some time now, efforts have been made to render the environment in which the industrial worker spends his working time safer; the legal aspect is embodied in the Factories Act and the Ministry of Labour Regulations, while advice is given by factory inspectors and the Royal Society for the Prevention of Accidents.

The report on accidents falls into two parts: the first part concerns itself with the general factors likely to affect all workers in different degrees; the second part deals with the individual differences which result in reactions which are not uniform.

General Factors affecting the Incidence of Accidents

(1) *Hours of work.* During the War of 1914–18 investigations showed that unduly long hours led to an increase in the accident-rate, and there is evidence that fatigue was largely responsible. In war-time longer working hours are necessary, but there comes a point past which it is no longer profitable to let people work. Fatigue not only reduces the speed and accuracy of muscular movements, but also affects mental alertness.

(2) *Heating and ventilation.* The number of cuts and minor accidents increases with temperatures much above or below the range of 65–69° F. Where processes generate much radiant heat the worker should be protected. Adequate ventilation should not be regarded merely as a side issue.

(3) *Lighting.* Lighting so inadequate that the worker cannot see his work effectively is a contributory cause of accidents. Too great a variation in lighting must also be avoided. Natural lighting, that is, daylight, is ideal when there is enough of it.

(4) *Speed.* Speed of production is a frequent cause of accidents, and since it is necessary in modern industry, care must be taken that machines are not moving too quickly, nor workers put on to speeds to which they cannot adjust themselves.

(5) *Inexperience and age.* Both these conditions are related to accidents, but are independent. People, whatever may be their age, if inexperienced at industrial work, are known to have a higher accident-rate than a similar group of experienced workers. Also young people, whether experienced or not, are more liable to have accidents than older people, partly because they are less responsible and partly because they have less control over their muscles. Therefore there should be adequate training for beginners, whether young or not, and adequate supervision for the young.

(6) *Fitness for the work.* Quite apart from physical unfitness a worker may be mentally ill-adapted to his work. There is evidence that workers of high mental ability, if employed on repetitive work demanding little thought, become bored, which state

* The Personal Factor in Accidents. Emergency Report No. 3. Industrial Health Research Board. 1942. 4d. net.

leads to a variable output, fatigue and therefore to a high accident rate. This question of fitness is connected with that of vocational selection, to which far too little attention is paid.

(7) *Attitude of management and workers.* Both management and the workers have a part to play in accident prevention. If the former takes up the attitude that accident prevention is not an essential part of production, then there is little likelihood of a serious reduction even though lip service be paid to safety committees.

On the other hand, even proficient workers often neglect to take safety precautions because each works on the very human principle of "It can't happen to me". Although a worker may be very proficient, that does not connote an immunity to accidents; a temporary lack of thought due perhaps to slight physical ill-health or mental pre-occupation may have serious consequences. Also the expert workers have a responsibility for the less expert, since these, particularly if young, tend to imitate the former. Care is not synonymous with fear.

Accident-proneness

When all the above causes have been considered there yet remains a factor that has been dimly recognized but until recently ignored. Everyday experience or the examination of accident statistics makes it clear that, given similar conditions of environment, or of the other factors already mentioned, there are people who have more accidents than their fellows. This difference is attributed by some to chance or to the effect of a first accident on a person's liability to another. Scientific analysis has, however, shown the special importance of a condition which is now known as 'accident-proneness'.

Statistical workers were the first to study systematically the unequal distribution of accidents among people exposed to the same risks. It is obvious that the accidents studied have been chiefly minor ones, since fortunately major accidents are not sufficiently frequent during a reasonable period of observation. Where, however, it has been possible to relate major accidents with minor ones, it has been found that those who had many of the latter also had an undue number of the former. Efforts made, therefore, to prevent people specially susceptible to accidents from dangerous work will protect them both from major and minor accidents.

Accident-proneness must be distinguished from accident liability. Liability to accident is largely determined by the degree of risk to which a person is exposed. Differing environmental conditions alter accident liability quite apart from any personal characteristics predisposing towards accidents. Although general liability differs from one group of workers to another according to the nature of their occupation and working conditions, yet in any one group of workers, however great or small may be the risk, some have more than their fair share of the accidents.

Psychological investigations have shown that those with an unduly high accident rate can be partly differentiated on the basis of measurable individual reactions.

So far only one factor of this accident-proneness has been identified and measured; others may eventually be measured; some may never be. For nearly twenty years investigators have been experimenting to find some test or group of tests to serve

as a means of predicting this minority. Tests used to measure the capacity to respond accurately within a controlled time interval to various sensory stimuli have given reliable results in the case of skilled workers. In skilled occupations those who do well in the tests have been found to have, not only a lower accident rate, but also a higher rate of proficiency than those who do badly. Unfortunately, the tests cannot select all the accident-prone, though they do select a fair proportion.

There is no question of not employing the accident-prone; they are perfectly normal people who can be usefully employed in most occupations, but if employed in an occupation with a high accident liability they are a danger to themselves and to others.

Accident liability is the sum total of all the factors determining accident incidence; accident-proneness refers solely to the individual factors affecting it.

There are two ways of partially predicting the accident-prone. One is by finding the number of accidents sustained by each individual in a working group during a previous period of exposure; the other by using certain tests. The most effective way is to combine both methods. This procedure has been shown in both transport and industrial accidents to reduce the subsequent accident rate to an appreciable extent.

It must be emphasized that if proper use is to be made of our knowledge it is most important that adequate records should be kept. Quite apart from the humanitarian aspect of accident prevention, a reduction in the working time lost would have a beneficial effect on production.

MAY SMITH.

OBITUARIES

Dr. S. G. Barker, O.B.E.

THE world of fibres in its industrial development lost an outstanding personality and one of its greatest authorities in the sudden death, on August 28 last, of Dr. Sydney George Barker, scientific adviser to the Indian Jute Mills Association since 1934. Prior to taking up this appointment, the late Dr. Barker had been director of the Wool Industries Research Association, and most of his scientific and business life during the last twenty years was occupied in conducting and controlling investigations into the sources, preparation, properties and commercial utilization of the scarcer—principally hard—fibres.

Dr. Barker was born in York in 1887, of typical Yorkshire Nonconformist stock, and, throughout his life, he displayed all the sterling qualities and rugged honesty of character and purpose of his origin and upbringing. His early education in York was followed by study—principally of physics and mathematics—at the Imperial College of Science and Technology, London, and at the University of Berlin. He was one of the early holders of the research scholarships, tenable in German universities, instituted as a result of the efforts of the late King Edward VII to bring about a closer understanding between the two countries. Academically, although he won a number of distinctions, his progress was marked more by the steady and sustained effort of his acutely critical and inquiring mind than by any brilliant scholastic achievements.

In 1915, Dr. Barker began that long connexion with India and Indian industries which was to continue until the close of his life. He became director